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FarmFacts

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Management decisions on the selection and use of farm machinery can greatly affect the financial success of a farm. As the size of farms continues to grow and machinery investments increase, efficient management of equipment becomes more important. In 1987 in Saskatchewan, machinery and equipment investment was nearly $6 million or 22% of total farm investment. Machinery and equipment investment averaged $120 per cultivated acre. Machinery cash expenses averaged $11.83 per cultivated acre or 25% of total cash expenses in 1988 in Saskatchewan.

Since machinery costs are a significant part of total costs, farm managers should carefully monitor their machinery costs and reduce machinery costs where possible in order to maximize Net Farm Income. This fact sheet provides a method of calculating machinery costs. In conjunction with historical records of your machinery costs, the following information should assist you in planning and decision making.

[redacted]

The following approach outlines how to calculate machinery costs.

Fixed Costs

Some costs occur regardless of the amount of use of a machine, and are calculated on an annual basis. These annual costs are normally referred to as fixed or ownership costs and make up 60-65% of total machinery costs. These costs include depreciation, investment cost, insurance and housing cost.

Depreciation refers to the loss in value of a machine from wear and obsolescence. Depreciation can also be considered as a fund setup to replace the original value of an asset in a certain number of years. The formula for calculating an average annual depreciation for a machine is:

$$\text{Depreciation} = \frac{\text{Original Cash Cost - Cash Sale Value}}{\text{Years of Use}}$$

Investment cost represents the cost of borrowing money, or the interest which could be earned if the capital were invested elsewhere. It is determined by multiplying the average annual investment by the interest rate as follows:

$$\text{Investment Cost} = \frac{\text{Original Cash Cost + Cash Sale Value}}{2} \times \text{Interest Rate}$$

Insurance and housing costs allow for the risk of equipment loss, the cost of housing and for a possible higher depreciation and repair cost which may result if equipment is not housed. The effect of housing benefits should be considered in estimating trade-in values and repair costs. An allowance of 1% of original cash cost usually covers annual insurance and housing costs.

Insurance and Housing =
Original Cash Cost x 1%

Variable Costs

Some costs occur only when a machine is used. These costs include fuel, lubrication, repairs and labour. Since these costs vary with the amount of use, they are expressed on an hourly basis and are generally referred to as variable costs.

Fuel costs can be estimated on an hourly basis (i.e. litres per hour x price per litre).

The following formula can be used to determine fuel cost when actual consumption is not known.

Fuel cost =
PTO hp x .75 x Fuel Consumption Factor (L/KwHr) x Cost of Fuel ($/litre)

Fuel Consumption Factor: Based on Nebraska tractor test data, three fuel consumption factors have been calculated in litres of diesel per kilowatt hour.

	Fuel Consumption Factors
Heavy Operations	.31 l
Annual Average	.24 l
Light Operations	.19 l

For Example: Calculate the fuel cost of a 125 hp tractor doing light operation such as spraying. Diesel is $.29/l.

Fuel cost
= PTO hp x .75 x Fuel Consumption Factor x Cost of Fuel
= 125 x .75 x .19 x $ 29
= $5.17/hour

Lubrication costs vary between machines. A suggested guide is 35c/ /hour for each 100 horse power.

Repair costs per hour can be determined by estimating the total

repair cost of the machine, and then dividing by the hours of use. Repair costs and hours of use may be on an annual, lifetime of other time period basis. Repair costs can be based on a percent of original cost. The Saskatchewan Agriculture publication Farm Machinery Custom and Rental Rate Guide, appendix F lists the average repair rates for various farm equipment.

$$\text{Repair Allowance} = \frac{\text{Total Repair Cost}}{\text{Hours Use}}$$

Labour may be charged as either the cost of hired labour, or the estimated value of the owner's labour. Although labour is not a machine cost, it should be taken into account in comparing different sizes of machines and the calculation of custom rates.

Using the costing procedures outlined in the preceding section, one can determine total costs of equipment on an annual, hourly, or on an acreage basis. These costs can then be used as a guide in management decisions involving trading machinery, buying used or new machinery, custom hiring, or leasing machinery, or whether joint ownership of machinery is warranted.

Calculation of Machinery Costs (Example)

The following example illustrates how to calculate machinery costs using the preceding costing approach. Calculations are made for annual and per hour costs of a 150 hp, 2WD tractor.

Assumptions:
- Original Cash Cost - 60,000;
- Depreciation lifetime - 13 years;
- Annual hours use - 600 hours;
- Annual repair rate - 5%; interest charge - 10%.

Fixed Costs (per year):

Depreciation = $\frac{\$60{,}000 - \$6{,}000}{13}$ = $4,154

Investment Cost = $\frac{\$60{,}000 + \$6{,}000}{2} \times 10\%$ = $3,300

Insurance and Housing = $60,000 x 1% = 600

Total Fixed Costs Per Year = $8,054

Fixed Costs Per Hour = $\frac{8{,}054}{600}$ = $13.42 (A)

Variable Costs (per hour):

Fuel - 32 litres/hour x $.29/l	9.28
Lubrication - $.35/100 hp x 150 hp	.53
Repairs = 5% x $60,000 = 3,000 = 600 hours 600	5.00
Total Variable Costs per Hour	14.81

= 14.81 (B)

Total costs per Hour (A + B) $28.23

Total Costs Per Year:

= Total Fixed Costs/Year + (Total Variable Costs/Hour x Annual Yours Use)
= $8,054 + ($14.81 x 600) = $16,940

The Saskatchewan Agriculture publication "Farm Machinery Custom and Rental Rate Guide" contains information on how to calculate a Rental Rate (Appendix C) and a Custom Rate (Appendix D). Appendix F contains the machinery cost calculation guides. Obtain a copy of the above publication from your Rural Service Centre.

The following example is the same as the previous machinery cost example but uses the machinery cost calculation guides, Appendix F in the "Farm Machinery Custom and Rental Rate" bulletin. See the assumptions in the previous example.

Fixed costs/hour = FC/hr/$1000 orig. cost x $\frac{\text{orig. cost}}{1000}$
= .2237 x $\frac{\$60000}{1000}$ = $13.42

Repair costs/hour = Rep. cst/hr/$1000 orig. cash cost x $\frac{\text{orig.cost}}{1000}$
= .0833 x $\frac{60000}{1000}$ = 5.00

Fuel = 32 litres x $.29/litre = 9.28
Lubrication = $.35 x $\frac{150\text{hp}}{100\text{hp}}$ = .53
Total costs per hour = $28.23

The following formulas can be used to calculate acres per hour for different field operations.

Acres Per Hour
- Tillage Operations (82.5% field efficiency)
  $\frac{\text{Machine Width (ft) x Speed (mph)}}{10}$
- Seeding and Harvesting (69% field efficiency)
  $\frac{\text{Machine Width (ft) x Speed (mph)}}{12}$
- No Till Seeding* (63% field efficiency)
  $\frac{\text{Machine Width (ft) x Speed (mph)}}{13}$

* Reduced seeding rate is due to increased fertilizing rates and more difficult seeding conditions (i.e. straw)

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